

**MEMORANDUM**

**SUBJECT:** Request to Conduct an Engineering Evaluation/Cost Analysis for the Johnny M Mine Area Site, near San Mateo, McKinley County, New Mexico

**FROM:** Warren Zehner, On-Scene Coordinator  
Removal Team (6SF-PR)

Jon Rinehart, On-Scene Coordinator  
Removal Team (6SF-PR)

**THRU:** Ronnie D. Crossland, Associate Director  
Prevention and Response Branch (6SF-P)

**TO:** Carl Edlund, Division Director  
Superfund

• **PURPOSE**

The purpose of this Approval Memorandum is to request and document approval to conduct an engineering evaluation/cost analysis (EE/CA) for a non-time critical removal action proposed for the Johnny M Mine Area (Site), McKinley County, New Mexico.

The proposed EE/CA is expected to be a potentially responsible party (PRP) lead action. The PRP is Hecla Mining, hereinafter referred to as the Respondents in the Approval Memorandum. The EE/CA document and other actions required in compliance with any settlement agreement will be conducted with oversight by the U.S. Environmental Protection Agency (EPA) to ensure that the Respondent actions are conducted in accordance with applicable laws, regulations, and EPA policy and guidance.

This action meets the criteria for initiating a removal action under the National Contingency Plan (NCP), 40 CFR 300.415.



- **BACKGROUND**

CERCLIS ID: NMN000607139

Site ID: A6AH.

Latitude: 35.361959

Longitude: -107.7211956

- Site Location

As shown in Figure x, the Site is located approximately 4.4 miles west of the Village of San Mateo and approximately 1 mile north of New Mexico Highway 605, McKinley County, New Mexico (latitude 35.361959, longitude -107.7211956).

- Site Description

The Site is the location of a former underground uranium mine, Johnny M (JMM) and the associated surface support areas for the mining operations. The scope of this memorandum only addresses the radiological contamination associated with the surface support areas for the underground mining operations. The following information is a fairly accurate historical description of Site operations based on available federal and State (add Hecla info from SIR?) government regulatory records. According to historical information obtained from the New Mexico Environment Department (NMED) and/or the United States Nuclear Regulatory Commission (NRC) records, the JMM is an underground uranium mine operated by Ranchers Exploration and Development Corporation (Ranchers) from 1972 until 1982. In 1984, Ranchers merged with Hecla Mining Company. No uranium ore milling was performed on the mine property. The uranium ore was transported approximately nine miles, via a haul road across the Site to the Kerr McGee Ambrosia Lake uranium mill for processing.

In 1977, Ranchers made an urgent request to the New Mexico Environmental Improvement Division (NMEID) to pump slurries of uranium mill tailings into the non-operational underground structures of the mine to prevent the mine from being overcome by groundwater. This action was approved by NMEID and the activities were regulated through a Radioactive Material License, NM-RED-MB-15, issued to Ranchers. As part of the regulatory approval, Ranchers was required to apply for a surface water discharge permit for the JMM. The mine produced approximately 1,000,000 gallons of water per day. These uranium mill tailings that were utilized for the slurry originated from the Kerr-McGee Ambrosia Lake uranium mill (NRC Source Material License SUA-1473).

By the slurring and injection process, approximately 286,000 tons of uranium mill tailings were disposed of in the JMM as part of the groundwater infiltration abatement process or the

subsequent mine closure operations. The uranium mill tailings were trucked from the aforementioned uranium mill and placed into one or more staging or stockpile areas within the current Site boundary, then mixed with discharge water from the mine in one or both of the surface impoundments for the JMM. This slurry was then pumped into the mine at two locations, which are designated as the north vent hole and the south vent hole.

In late 1986, the NMEID relinquished its licensing authority for uranium mills back to the NRC. In 1987, the NRC issued Source Material License SUA-1482 to Hecla to complete the closure of the JMM. Closure operations were completed in 1987 and the NRC terminated Source Material License SUA-1482 in 1993. Closure operations were confined to a one acre tract that was used for mixing of the aforementioned slurry. All other support operations and storage areas of radiological containing substances was not addressed during this closure process.

- Site Ownership

The Site is composed of the surface support areas for the underground mining operations at the JMM. The Johnny M is located in the east ½ of section 18 and section 7, Township 13N, and Range 8W. It is located on property owned by the (b) (6). The west ½ of section 18, Township 13N, Range 8W is owned by Hecla Mining. Ranchers Exploration and Development owned and operated the Johnny Mine from 1972 to 1982. Ranchers Exploration and Development was merged with Hecla in 1984. The property that was owned by (b) (6) was sold to Hecla in April 2012. (?) Also, need clarify boundaries of entire Site, Hecla and (b) (6) property. The Operable Unit 1 (Area A) was the Johnny M Mine Site and Operable Unit 2 (Area B) was the residential property that was owned by (b) (6). (See map x) Area C is located on the (b) (6) Ranch, which west of the former (b) (6) property.

- **NATURE AND EXTENT OF CONTAMINATION**

- A. EPA Radiological Assessment

In November 2010, the Environmental Protection Agency, Region 6 Prevention and Response Branch (EPA PRB) received a request for assistance in the evaluation of this Site for potential removal action from the State of New Mexico Environment (NMED). Documentation provided by the NMED indicated that the site was adjacent to a former underground uranium mine. This property was thought to be potentially contaminated with uranium mine waste or uranium mill tailings originating from the mining and/or mine closure operations on the former mine. Based on this information, the Superfund Technical and Response Team (START) III contractors were tasked by EPA PRB to conduct a Radiation Removal Assessment on the Site. As part of this radiological assessment a quality assurance sampling plan (QASP) was developed for the project documenting standard operating procedures (SOPS), assessment protocols, and data decisions tree consistent with current EPA guidance and other best management practices.

The elevated concentrations of several radio-isotopes and their associated progeny in uranium mine/ uranium mill waste and soil/debris that has become contaminated with the aforementioned radioactive waste materials (“waste materials, hereafter to mean all of the waste types previously described) are contaminants of concern on this Site primarily from gamma and other forms of ionizing radiation associated with these radio-isotopes. Principally, the contaminant of concern is radium-226 ( $^{226}\text{Ra}$ , hereafter to mean isotope and progeny) primarily from the mill waste associated with mining operations and subsequent mine closure operations conducted on the Johnny M Mine (JMM). In addition to  $^{226}\text{Ra}$  contamination, uranium-238 ( $^{238}\text{U}$ , hereafter to mean, all the isotopes and their progeny) generated from various mining operations associated with the JMM, including surface discharge of mine process water and the transport of ore across the Site, is also of concern on this Site. These radio-isotopes have been dispersed by anthropogenic means throughout the surface and near surface soils present on the Site. The elevated concentrations of radio-isotopes and associated radioactivity above normal background levels, expressed in counts per minute (CPM) and micro-roentgens per hour (micro R/hr) present on the Site appear to be the direct result of the uranium mining and/or mine closure operations conducted within the boundaries of the Site.

The EPA limited its surface radiological survey on the Site the former (b) (6) property (OU 2) because the property owner of OU 1 had denied voluntary access to the property. Hecla subsequently gained access to OU 1 and conducted a Site Investigation which is discussed in Section II.B, below. Surface radiological surveys have been conducted utilizing a 2”x 2” gamma scintillation detector. Gamma radiation levels near the residence and the former small business infrastructure located in OU 2 are as high as 500,000 CPM, as compared to the OU 2 specific background of 10,016 CPM. Gamma radiation exposure data collected on the Site ranged as high as 2,000 microR/hr as compared to background levels of approximately 15 microR/hr. (See Interim Status Report, Johnny M Mine Area Uranium Structures Removal Assessment April 6, 2011 Attachment )

Uranium-238 and  $^{226}\text{Ra}$  are the principal contaminants of concern on this Site based primarily on the gamma and other forms of ionizing radiation associated with these radio-isotopes. Radiological dose is measured in milli-rem per year (mrem/year). The *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination*, August 22, 1997 (OSWER Directive 9200.4-18) established a general, maximum acceptable radiological dose level of 15 mrem/year for non NRC licensed facilities. Further, this guidance document states that 15 mrem/year Total Effective Dose Equivalent (TEDE) represents an excess cancer risk of  $3 \times 10^{-4}$ , and is considered essentially equivalent to the presumptively protective excess cancer risk level of  $1 \times 10^{-4}$ . The *Protocol for Uranium Home Site Assessment, Grants Mineral Belt Uranium Project: Cibola and McKinley Counties, New Mexico, December 2009*, documents the regulatory consistency with EPA 1997. OSWER 9200.4-18 and the process used for conducting the radiological assessment on this property. The START III Certified Health Physicists (CHPs) have evaluated the radiological data from the property collected to date, and have estimated the dose to the resident

residing on OU 2 is 3,400 mrem/year using the ResRad computer model, which is accepted by the NRC, and input values determined from current site specific radiological measurements. This estimated dose to the resident is more than 200 times the acceptable TEDE of 15 mrem/year, and the excess cancer risk of  $3 \times 10^{-4}$  is exceeded by a similar factor.

As previously stated, the primary contaminants of concern at the Site,  $^{238}\text{U}$  and  $^{226}\text{Ra}$  and their associated progeny, are hazardous substances as defined in Section 101(14) of CERCLA, 42 U.S.C. 9601 (14) and 40 CFR 302.4. The following are the known health effects associated with exposure to the aforementioned hazardous substances on the Site.

### **Radium-226**

Radium-226 is principally a source of alpha and gamma radiation, although some beta radiation is also produced during the decay process. According to the ATSDR *ToxFAQs for Radium* (July 1999) document, exposure to  $^{226}\text{Ra}$  can cause adverse effects to the eyes (cataracts) and blood (anemia). Radium-226 has been identified by the EPA and the National Academy of Sciences as known human carcinogen, being specifically linked to cancers of the bone, breast and leukemia.

Exposure pathways are the routes that a contaminant can take in order to be assimilated by a human or animal. For example, incidental ingestion of contaminated soils through direct contact or the inhalations of contaminated airborne particles (dust) are both exposure pathways. The exposure pathways of concern at the Site are described below:

The predominant exposure pathway related to  $^{226}\text{Ra}$  was determined to be external gamma radiation, contributing over 90% of the total effective dose equivalent (TEDE) in the DOE residual radiation (ResRad) modeled scenario utilized for the EPA radiological assessment.

A significant amount of the surface area of this Site is contaminated with elevated concentrations of  $^{226}\text{Ra}$  at or near the surface. The contaminated soils are fine grained and have a high probability of adherence to skin, clothing and fur as a result of direct contact. For humans, incidental ingestion of the contaminants adhering to skin or clothing can occur through normal hand-to-mouth activities such as play or mealtime.

Inhalation is another exposure pathway at this Site. As discussed above a significant amount of the surface soils on this Site are contaminated with  $^{226}\text{Ra}$ . The contaminated soils tend to be fine grained on this Site are contaminated with  $^{226}\text{Ra}$ . The contaminated soils tend to be fine grained and dusty, are easily airborne after wind or mechanical disturbances, and subject to inhalation by humans, livestock and endemic fauna.

### **Uranium**

Uranium is a widespread mineral forming heavy metal that in nature is composed of three isotopes  $^{238}\text{U}$ ,  $^{235}\text{U}$ , and  $^{234}\text{U}$ , with the  $^{238}\text{U}$  isotope generally composing over 98% of the

mixture. All of these isotopes are the same chemically, but they have different energy and decay properties. According to the ATSDR *ToxFAQs for Uranium* (October 1999) document, U is an alpha ionizing radiation emitter and in general, weakly radioactive. Exposure to excess levels of U isotopes can cause human tissue damage, primarily in the kidneys. Cancer risk from exposure to excess levels of U isotopes appears to be low to none. The primary risk on this Site from U isotopes is cancer caused by exposure to the progeny generated by its decay.

- Hecla Site Investigation

The estimated volume of soil for Area A (OU1 Johnny M Mine Site), Area B (OU2 former (b) (6) Property), and Area C (area to the west of former (b) (6) Property) is 314,000 cubic meters. This is the soil that exceeds the 3.5 pCi/g level clean up level for radium 226.

The results from the Hecla investigation on Area B (OU2) is very similar to the investigation conducted by EPA.

**Need to some HECLA results in here, mostly extent in OU1, range of contaminants, volume estimates, etc.**

Maps, pictures and other graphic presentations

Attachment 1-Figure 3-1 Site Location Map

Attachment-2 Figure 3-3 Site Sketch Map

Attachment-3 Operable Unit Map

Attachment-4 Interim Status Report, Johnny M Mine Uranium Structure Removal Assessment

Attachment-5 Site Investigation Report for the Johnny M Mine and Adjacent Properties, September 2013

Attachment-6 Settlement Agreement and Administrative Order on Consent for Removal Action Johnny M Mine Site Hecla Limited CERCLA Docket No. 06-11-12 August 16, 2012

- **THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT**

Substances found at the Site, including the substances identified above in the Nature and Extent of Contamination, constitute “hazardous substances” as defined by Section 101 (14) of CERCLA, 42 U.S.C. 9601(14).

- Human Health and the Environment

The elevated concentrations of hazardous substances indicate that human exposure pathways exist through air (inhalation) direct contact (dermal), and soil (ingestion). Nearby residents, and/or trespassers could be exposed to the contaminants.

The potential for exposure is elevated further because Site has limited vegetative cover and is located in a semi-arid portion of the State of New Mexico which is subject to severe and prolonged windstorms with wind gust up to 55 mph are common. In addition to the windstorms this part of New Mexico is prone to heavy episodes of flash flooding during the Monsoon Season. Both of these documented weather conditions may result in the redistribution of contaminants throughout the surrounding environment and adjacent residential properties.

Ecological receptors, including avian, mammalian, and plant receptors, could become exposed to elevated site contaminants found in soils through direct contact with the contaminated materials and with water and sediments contaminated by the materials; ingestion of soils, water, and sediments contaminated by the materials ; and ingestion of contaminated food (e.g., sediment-or soil-dwelling insects, vegetation).

- Expected Change if No Action is Taken

If no action is taken, or if this is delayed:

- Hazardous substances will remain as potential human health and environmental threats based on inhalation, direct contact, and ingestion pathways; and

- Hazardous substances will remain a potential continuing source of solid airborne (dust) and dissolved/suspended phase (uncontrolled run-off) contaminants to the surrounding residential properties and San Mateo Creek.

## **V. Endangerment Determination**

The actual or threatened release of hazardous substances within and from the Site may present an imminent and substantial endangerment to public health, welfare, or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. 9606(a).

## **VI. Proposed Project/Oversight and Costs**

The EE/CA will assist with defining the scope of the removal action. Prior EPA investigations focused on the .residential area. There are other outlying areas not yet evaluated that will require

investigation to determine whether those areas warrant cleanup. Based on the analysis of the nature and extent of contamination and on the cleanup objectives developed as part of the EE/CA, a limited number of removal action alternatives will be identified and evaluated against the scope of the removal action alternatives and against each specific objective. The likely technology alternatives that will be subject to detailed analysis include contaminant, in-situ and ex-situ solidification /stabilization, reprocessing, and off-site disposal. Bench -scale treatability investigations may be conducted to provide sufficient data to allow the alternatives to be fully developed and evaluated, and to reduce cost and performance uncertainties' so that a removal alternative can be selected. A final removal alternative will be selected following public comment and evaluation, Costs for conducting the EE/CA are approximately \$350,000, including EPA oversight.

## VII. Recommendation

Conditions at the Johnny M Mine Site meet the criteria in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300.415, and I recommend your approval to conduct an EE/CA.

APPROVED: \_\_\_\_\_ DATE: \_\_\_\_\_

Carl Edlund, P.E. Director

Superfund Division



;